REMARKS

In the Office Action dated June 1, 2010 and marked final, the Examiner maintains his rejection of claims 1-25 under 35 U.S.C. § 103(a). With this response, no claims are amended, added or canceled. After entry of this Response, claims 1-25 are pending in the Application. Reconsideration of the Application in view of these remarks is respectfully requested.

Response to rejections based on Kato et al. in view of Serizawa et al.

The Examiner rejects independent claim 1 and its dependent claims 3-6 and 20, independent claim 7 and its dependent claims 9-12 and 22, independent claim 13, and independent claim 14 and its dependent claims 16-19 under 35 U.S.C. §103(a) as being unpatentable over Kato et al. (US 6,082,482) in view of Serizawa et al. (US 5,347,458).

The Examiner states that Kato et al. teaches all of the features of the independent claims except for a summation formula that uses a steering angle, steering velocity and steering acceleration terms. The Examiner states that Serizawa et al. shows such a summation equation using gains for steering angle, velocity and acceleration. The Examiner states that it would have been obvious to one skilled in the art at the time the invention was made to include such a summation in Kato et al. because the reaction force is supposed to replicate the feeling of a mechanically coupled steering wheel, and steering velocity and acceleration effect the feeling of steering a mechanically coupled steering wheel. The Examiner further states that since steering angle velocity and acceleration are used in Kato's hands off state embodiment of FIG. 7, it would be obvious to use these terms in the hand-on state as well to simplify the formula, such as in the embodiment of FIG. 10.

On pages 3-4 of the Office Action, the Examiner states that Kato et al. discloses a controller adapted to vary the control signal to reduce the steering reaction force applied when the hands of state is indicated. However, Kato et al. actually states that when the driver's hands-free state is detected, the reaction force control is not executed. (Col. 7, ll. 11-13). This does not meet the claim limitation that states the reaction force is reduced by changing the value of one of the coefficients in the equation. The claim does not require changing the equation itself, as disclosed by Kato et al.

On page 4 of the Office Action, the Examiner states that since Kato et al. does not specifically teach using steering angular velocity and acceleration when hands-free state is not detected, those coefficients for these terms can just be set to zero. This directly contradicts the claim language. The claim language of the independent claims requires that the absolute values of the steering angular velocity and acceleration are different at different speeds. If the coefficients were set to zero, the value would be zero at any speed. Accordingly, this does not meet the claim language.

On page 4 of the Office Action, the Examiner states that Kato et al. discloses the use of steering angle, steering angle velocity and steering angle acceleration. The Examiner substitutes the difference between steering angle velocities, which he calls the steering angle acceleration, to determine one parameter of Kato et al.'s calculation. Nowhere does Kato et al. disclose determining a value for each of the three and summing the values.

Reducing reaction force is expressly described by Kato et al. only with reference to the embodiment of FIG. 10. To the extent that the Examiner contends that the completely different calculations designed merely to return the wheel to the neutral position in FIGS. 4 and 7 would also result in a reduction in reaction force, Applicants submit that the Examiner has not provided any support for such a conclusion. Furthermore, FIG. 10 relies on the calculations described in FIG. 5. This formula is generally based on a deviation between a measured motor current and a target motor target current, which is in turn based on a deviation of the reaction force instruction torque as indicated by the driver's driving wheel steering angle and the detected steering torque. FIG. 5 fails to teach or suggest that calculating reaction force is equal to a summation of a plurality of terms, the plurality of terms including at least a steering angle term $Kp*\theta$, a steering angle velocity term $Kd*d\theta/dt$ and a steering angle acceleration term $Kdd*d^2\theta/dt^2$; wherein θ is a steering angle of the steering wheel, Kp is a steering angle gain, Kd is a steering angle velocity gain, and Kdd is a steering angle acceleration gain.

Serizawa et al. describes only operation in a hands-on state. Even if Serizawa et al. disclosed a similar means of calculating reaction force control, Serizawa does not contemplate the use of such control in a hands-off situation. Kato et al. discloses a different reaction force control calculation than both Serizawa et al. and Applicants for hands-on

control, along with disclosing the use of other calculations for hands-off control. Accordingly, the Examiner has failed to provide any motivation for one skilled in the art to use the equation of Serizawa et al. in the hands-off mode of Kato et al. There is no teaching or suggestion in either reference to use the exact same equation in both a hands-on and hands off mode.

Furthermore, on page 5 of the Office Action, the Examiner refers to FIG. 5a and col. 6, ll. 30-39 of Serizawa as disclosing a steering angle gain dependent on the steering angle such that the steering angle gain is non-zero when the steering angle is non-zero and dependent on vehicle speed such that an absolute value of the steering angle gain is higher at a first vehicle speed than at a second vehicle speed lower than the first vehicle speed. Applicants submit that col. 6, ll. 30-39 describes the coefficients used to calculate transfer function Gc. The disclosure does state that these coefficients are functions of vehicle speed, but that is all it discloses. The Examiner cites to the exact same paragraph as evidence of disclosure for a steering angle velocity gain dependent on a steering angle velocity such that the steering angle velocity gain is non-zero when the steering angle velocity is non-zero and dependent on the vehicle speed such that an absolute value of the steering angle velocity gain is higher at the first vehicle speed than at the second vehicle speed. The Examiner is requested to elaborate rather than just cite this paragraph, as Applicants clearly understand this paragraph of Serizawa et al. to disclose neither. The coefficients C2, C1, C0 and Cc are used in various equations described therein. (Col. 5, ll. 17-20) These coefficients are not summed in an equation to calculate reaction force.

On page 6 of the Office Action, the Examiner then states that Serizawa et al. shows the summation equation using gains M0, M1 and M2 for steering angle, velocity and acceleration. M2 is a constant used in a term for controlling the resistance of the steering wheel; M1 is a constant used in the damping term for preventing oscillatory movement of the steering wheel; and M0 is a constant used in the term that facilitates restoration of the steering wheel to its neutral position. (Col. 6, line 62- col. 6, line 2).

Applicants respectfully submit that the combination of these references by one skilled in the art would not render obvious the independent claims herein. Neither reference

discloses the use of a single equation for both hands-on and hands-off steering as described. Neither reference discloses the summation equation recited in each independent claim.

For all of the foregoing reasons, the combination proposed by the Examiner would not have been obvious to one skilled in the art at the time the invention was made. Thus, each of independent claims 1, 7, 13 and 14 and their dependent claims are allowable over the cited references.

Response to rejections based on Kato et al. in view of Serizawa et al. and Higashira et al.

The Examiner rejects claims 2, 8, 15, 21 and 23-25 under 35 U.S.C. §103(a) as being unpatentable over Kato et al. in view of Serizawa et al. and Higashira et al. (US 5,908,457). Claims 2, 8, 15, 21 and 23-25 depend from one of independent claims 1, 7 and 13 to include all of the limitations therein. As explained above, the combination of Kato et al. and Serizawa et al. fails to teach, suggest or render obvious the independent claims. Adding Higashira et al. to the combination does not cure the deficiencies of the combination with regard to the independent claims. Accordingly, claims 4, 8, 15, 21, 13 and 24 and dependent claim 25 are allowable over the recited combination at least due to their dependency from an allowable claim.

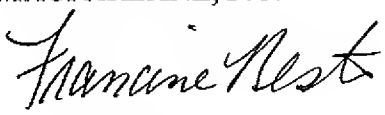
Conclusion

It is submitted that this Amendment has antecedent basis in the Application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Reconsideration of the Application is requested. It is respectfully submitted that the Application is in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present Application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

YOUNG BASILE HANLON &
MACFARLANE, P.C.



Francine Nesti
Registration No. 53376
(248) 649-3333

3001 West Big Beaver Rd., Ste. 624
Troy, Michigan 48084-3107